**Center Independent Research & Development: GSFC IRAD**

# Broadband Silicon Dielectric Mirrors for Infrared Astronomy

Completed Technology Project (2014 - 2015)

## Project Introduction

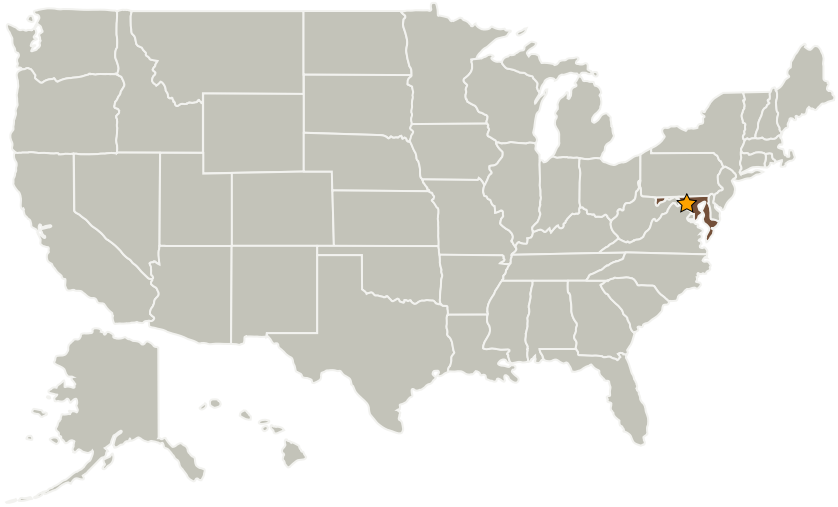
The goal is to mature our fabrication technology to enable broadband, low loss multi-layer dielectric coatings for the mid- to far- IR wavelength range to enhance the performance of optical components operating at cryogenic temperatures.

Conventional high reflectance optical coatings consisting of multilayer stacks of alternating high and low refractive index dielectric materials can achieve high reflectivity and low loss over the visible to the near infra red range. Unfortunately, conventional all-dielectric interference optical coating technologies are not viable for making these components in the mid to far-infrared range due to large thicknesses required and the lack of materials with low enough absorption at those wavelengths. Since the only structural material is silicon, the reflectors can operate over a large temperature range.

## Anticipated Benefits

The technology has general applicability to high reflectance coatings required for astronomical applications.

## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Goddard Space Flight Center(GSFC) | Lead Organization | NASA Center | Greenbelt, Maryland |

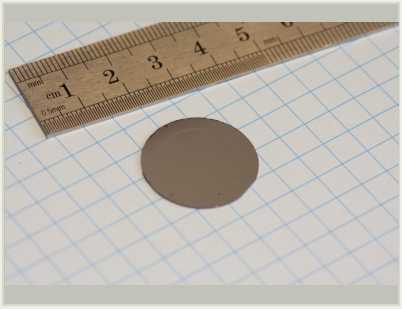


Photo of 18mm diameter mirror 3 layer Silicon mirror

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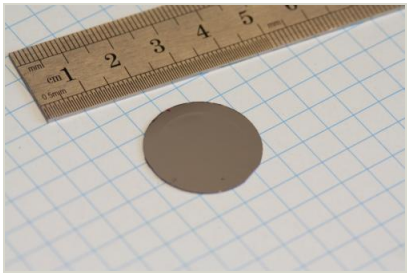
| Primary U.S. Work Locations |
| --- |
| Maryland |

## Images



**High Reflectance Silicon Dielectric Mirrors for Infrared Astronomy Project**
Photo of 18mm diameter mirror 3 layer Silicon mirror
*(https://techport.nasa.gov/image/4147)*

## Stories

Measurement of Transmission of Mirror Stack by Fourier Transform Spectroscopy
*(https://techport.nasa.gov/file/3401)*

## Links

Fluidic Based Assembly of Micron Scale Membranes
*(no url provided)*

GSC-16954-1
*(no url provided)*

## Project Website:

http://sciences.gsfc.nasa.gov/sed/

## Organizational Responsibility

**Responsible Mission Directorate:**
Mission Support Directorate (MSD)

**Lead Center / Facility:**
Goddard Space Flight Center (GSFC)

**Responsible Program:**
Center Independent Research & Development: GSFC IRAD

## Project Management

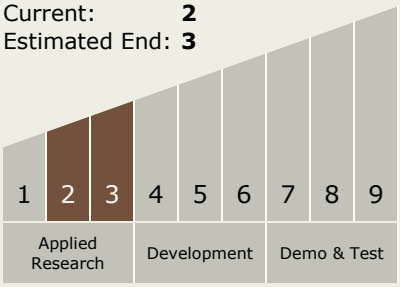
**Program Manager:**
Peter M Hughes

**Project Manager:**
Stanley D Hunter

**Principal Investigator:**
Kevin L Denis

## Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



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## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components